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FORM P7

REPUBLIC OF SOUTH AFRICA
Patents Act, 1978

COMPLETE SPECIFICATION

(Section 30 (1) — Regulation 28)

OFFICIAL APPLICATION NO.	
21 01	861133

LODGING DATE	
22	14 February 1986

INTERNATIONAL CLASSIFICATION	
51	E02B A01G

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TITLE OF INVENTION
54

"Drip Irrigation Systems"

THIS INVENTION relates to drip irrigation systems.

Drip irrigation systems usually include a continuous irrigation water supply line with drip emitters installed at intervals in the line or on the line. Irrigation water flows through the supply line under pressure, and a small amount of water continuously drips out at the places where the drip emitters are installed. Drip irrigation has proved to be highly successful in producing greater growth of vegetation for the same amount of water when compared with irrigation techniques such as overhead sprays.

A difficulty with drip irrigation systems that include buried supply lines and drip emitters is that plant roots grow most strongly towards a water source. Eventually the roots reach, grow into and block the minute openings through which water emerges from the drip emitters. It is therefore necessary at intervals to lift the supply line and attached emitters from the ground, clear the roots and re-bury the line. This is a time consuming operation with substantial risk that the line and emitters may be damaged.

Applicant is aware of experimental work which involved periodically dosing the water supply of an irrigation system with a herbicide. The herbicide used was a commercially

available grade of trifluralin which has the property, at the correct concentration, of regulating plant growth. When applied in irrigation water it interfers with normal root growth by inhibiting cell division without the herbicide being translocated to other parts of the plant. The concentration of trifluralin is critical because if it is supplied in too great a concentration it will kill the plant. Because it is impossible in every day farming to be totally certain that not too much trifluralin will be applied in error, periodic dosing of the drip irrigation water supply is not used on a commercial scale because of the fear of wholesale crop destruction.

The present invention provides a way in which a root growth inhibiting herbicide can be applied without, however, running the risk of crop damage due to the herbicide being supplied in too concentrated a form.

According to one aspect of the present invention there is provided a drip emitter for a drip irrigation system, the drip emitter consisting of, or including at least one component of, herbicide impregnated synthetic plastics material.

In one specific form the drip emitter includes a component defining a laybrinthine path along which, in use, water flows, the component bounding said channel being of herbicide impregnated synthetic plastics material. In another

form the emitter comprises a single component of herbicide impregnated synthetic plastics material.

Herbicide impregnated synthetic plastics material can be used for outside components so that the herbicide migrates directly into the surrounding soil when the drip emitter is buried. It is, however, preferred that one or more inside components be herbicide impregnated so that the water which, in use, flows through the drip emitter carries the herbicide into the surrounding soil. The herbicide impregnated component can be one of those which bounds a laybrinthine path through which the water must flow to reach the exit from the drip emitter.

According to a further aspect of the present invention there is provided a pipe or tape for a drip irrigation system, the pipe or tape having apertures cut in the wall thereof to allow water to flow from the pipe or tape to the soil, and the pipe or tape being an extrusion which includes synthetic plastics material which is herbicide impregnated.

Preferred herbicides are 2,6 dinitroanilines such as 4-difluoromethyl-N,N-dipropyl-2,6-dinitroaniline and 4-sulfonamide-2,6 dinitro-N.,N-dipropylanaline.

For a better understanding of the present invention, and to show how the same may be carried into effect, reference

will now be made, by way of example, to the accompanying drawing in which :

Figure 1 is a pictorial view of a length of irrigation supply line to which a drip emitter is fitted; and

Figure 2 is a partial section on the line II-II of Figure 1.

While a specific form of drip emitter has been illustrated in the accompanying drawings, and will be described in more detail hereinafter, it will be understood that the present invention can be applied to any form of drip emitter which is entirely injected moulded in synthetic plastics material, or which includes one or more components which are injection moulded in synthetic plastics material. The invention can also be applied to any form of drip irrigation supply line.

Figure 1 shows a drip emitter 10 secured to the exterior wall of a tubular irrigation supply line 12 of circular cross section. The supply line 12 has a smooth interior surface and a smooth exterior surface, i.e., no surface irregularities need be formed in the inside or outside wall of the supply line to enable it to have the illustrated emitter 10 secured to it. The supply line 10 is preferably made from a somewhat flexible, thin walled synthetic plastics material eg a thermoplastics material such as polyethylene. The drip emitter 10 is a one piece injected moulding of a material such as polyethylene.

Only one drip emitter 10 is shown in the drawing for simplicity. In practice, a drip irrigation system is formed by securing a number of such drip emitters to a continuous irrigation water supply line at intervals along the length of the line. Each drip emitter taps off a portion of the water flowing through the line and discharges the tapped off water at a low rate.

The drip emitter 10 comprises an elongate principal portion 14 that makes up most of the length of the emitter. A narrow ridge 16 projects above one end of the principle portion 14 of the emitter. The principal portion of the emitter is generally arcuate or U-shaped in cross section, as the emitter is viewed in Figure 2, and such cross sectional configuration is generally uniform along the length of the principal portion of the emitter.

A long, narrow recess 20 extends along the inside face of the emitter. The wall of the recess 20 is three-sided having a pair of longitudinally extending, laterally spaced principal wall portions 22 extending parallel to one another for most of the length of the emitter. An end wall joins the ends of the principal wall portions 22 near that end of the emitter which includes the ridge 16. At the opposite end of the emitter the principal wall portions 22 terminate to form an open discharge end 26 (see Figure 1).

The interior of the recess 20 has a plurality of longitudinally spaced apart ribs 28 that extend into it from both principal wall portions 22. In Figure 2 the ribs conceal the end wall of the emitter. The ribs on one side of the recess are staggered along the length of the recess with respect to the ribs on the other side of the recess 20. The ribs thus form a continuous zig-zag channel that constantly reverses its direction from the inlet end of the recess to the open discharge end 26. The inlet to the recess 20 is constituted by a small hole 30 formed in the wall of the line 12 near the end of the emitter which includes the ridge 16.

The emitter 10 shown in the drawings is described in more detail in the specification of Australian patent No. 539085. This Australian patent also describes the techniques which can be used to secure the emitter to the supply line.

It will be understood that water flows from the supply line 12 through the hole 30 and into the recess 20 which, as will clearly be seen from Figure 2, is bounded by portions of the emitter 10 and the outer face of the line 22. By moulding the emitter 10 in a herbicide impregnated synthetic plastics material it is possible to cause the herbicide to be dissolved in the water over a considerable period of time, and thereby prevent blocking of the outlet 26 by plant roots.

A master batch suitable for use in manufacturing the emitter 10 can be obtained by blending 58 parts by mass of polyethylene powder with 18 parts by mass of carbon black. The mixture is warmed to a temperature of 70°C. 24 Parts by mass of trifluralin are heated to 100°C which is sufficient to melt the trifluralin.

The mixture of polyethylene powder and carbon black is stirred and the melted trifluralin is slowly added. A dry friable powder results. This powder is pelletised by extruding it into strands and chopping into short lengths.

The master batch thus formed is mixed with the raw synthetic plastics material. For example, to obtain an emitter which has 2,4% by mass of trifluralin in it, 10% by mass of the master batch is tumble mixed with 90% by mass of the synthetic resin. The resulting material is used to injection mould the drip emitter 10.

It will be understood that, if desired, instead of injection moulding the entire emitter 10 using herbicide impregnated synthetic plastics material, it is possible to injection mould the emitter in two parts. For example, a main body part of the emitter can be moulded in non-herbicide impregnated synthetic plastics material, the body having a longitudinal groove in that face thereof which is adjacent the line 12. An insert is moulded in herbicide impregnated

material, the insert including the ribs 28 and being fitted in the channel in the main body part. A construction of this nature has the disadvantage that assembly work is necessary after the product has been moulded. An advantage of the construction is that the herbicide is only in those parts which are contacted by the water and not, for example, in the ridge 15 which is remote from the laybrinthine path along which the water flows.

An extremely simple form of irrigation system comprises a pipe or tape which has apertures in the form of holes or slits in the wall thereof. By the term pipe is meant a structure which is self-supporting and does not collapse inwardly in the absence of water under pressure. A 'tape' on the other hand is not self-supporting and collapses to flat form when not under internal pressure.

It is possible, in accordance with the present invention, to extrude irrigation pipe or tape using only synthetic plastics material which is impregnated with herbicide. It is also possible, because of the expense involved in impregnating the entire tube or tape, to extrude the tube or tape using mainly non-impregnated material, there being an integrally extruded internal longitudinally extending bead or protuberance which is of a material that is impregnated with herbicide.

The rate of release of the herbicide is a function of a number of factors. Thus, for example, the concentration of the herbicide in the synthetic plastics material from which it is moulded, water and soil temperatures, the concentration of the herbicide in the surrounding soil, the mass of the dripper, the surface area of the dripper, and the synthetic plastics material from which the dripper is moulded all influence the rate of herbicide release.

Laboratory experiments have indicated that if the mass of the dripper exceeds five grams and it is moulded using one of the common polyolefins, an effective life of ten years or more can be expected. By effective life is meant the period during which the herbicide being released prevents blocking of the dripper outlet as a result of root growth.

CLAIMS:

1. A drip emitter for a drip irrigation system, the drip emitter consisting of, or including at least one component of, herbicide impregnated synthetic plastics material

2. A drip emitter as claimed in claim 1, wherein the drip emitter includes a component defining a laybrinthine path along which, in use, water flows, the component bounding said channel being of herbicide impregnated synthetic plastics material.

3. An emitter as claimed in claim 1 and which comprises a single component of herbicide impregnated synthetic plastics material.

4. A drip emitter as claimed in claim 1, 2 or 3, wherein the herbicide is a 2,6-dinitroanaline.

5. A drip emitter as claimed in claim 4, wherein the herbicide is 4-difluoromethyl-N,N-dipropyl-2,6-dinitroaniline.

6. A drip emitter as claimed in claim 4, wherein the herbicide is 4-sulfonamide-2,6 dinitro-N,N-dipropylanaline.

7. A pipe or tape intended to form a supply line for a drip irrigation system, the pipe or tape having apertures cut in the wall thereof to allow water to flow from the pipe or tape to

the soil, the pipe or tape being an extrusion which includes herbicide impregnated synthetic plastics material.

8. A pipe or tape as claimed in claim 7, wherein said pipe or tape is extruded using only herbicide impregnated synthetic plastics material.

9. A pipe or tape as claimed in claim 7, wherein said pipe or tape is extruded using mainly non-herbicide impregnated synthetic plastics material with a zone of herbicide impregnated synthetic plastics material extending longitudinally of the pipe or tape.

10. A pipe or tape as claimed in claim 7, 8 or 9, wherein the herbicide is a 2,6-dinitroanaline.

11. A pipe or tape as claimed in claim 10, wherein the herbicide is 4-difluoromethyl-N,N-dipropyl-2,6-dinitroaniline.

12. A pipe or tape as claimed in claim 10, wherein the herbicide is 4-sulfonamide-2,6 dinitro-N,N-dipropylanaline.

13. A drip emitter for a drip irrigation system, the emitter being substantially as hereinbefore described with reference to the accompanying drawing.

14. A pipe or tape substantially as hereinbefore described.

DATED THIS 13TH DAY OF FEBRUARY 1986

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APPLICANT'S PATENT ATTORNEYS

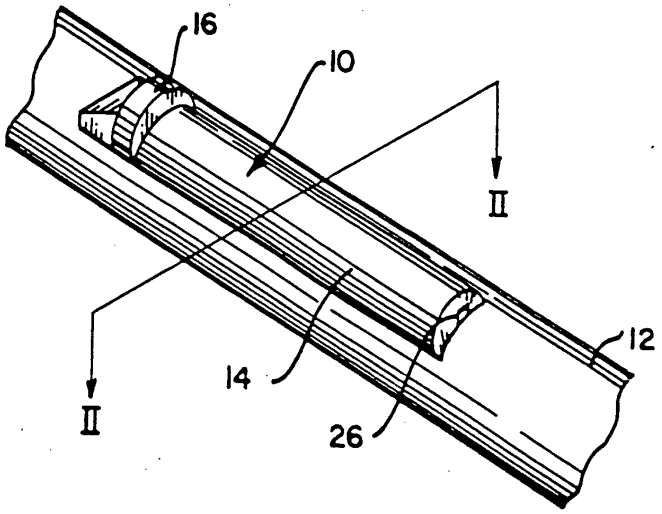

FIG. 1

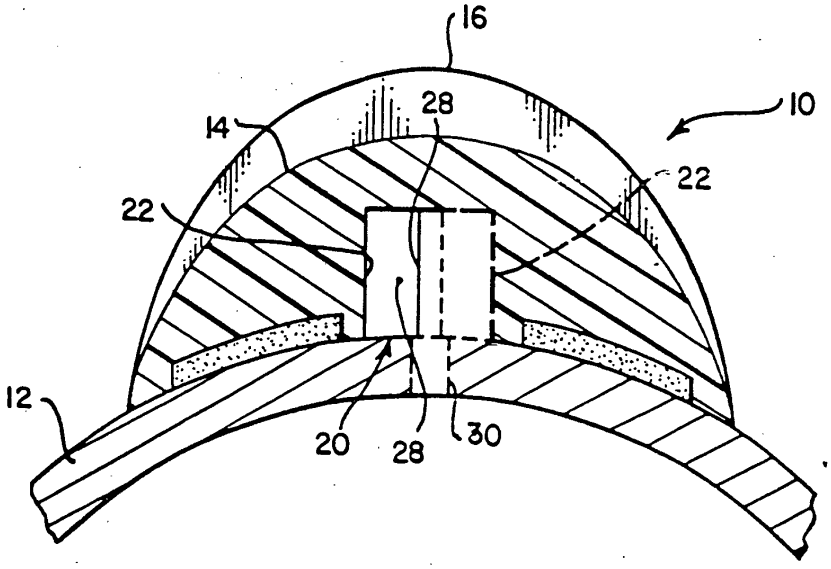

FIG. 2

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